arm

Going Arm - Arm HPC User Group at SC17

HPC Tools Update

13 Nov 2017

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Arm HPC Tools team

Mission Focus of the Arm HPC tools team

With a team of around 50 engineers based in the UK

GCC

Flang

openHPC

DynamoRIO

Open source tools and frameworks for Arm

- Arm DDT
- Arm MAP
- Arm Performance Reports

Commercial tools for any HPC platform

- Arm C/C++ Compiler
- Arm Fortran Compiler
- Arm Performance Libraries
- Arm Instruction Emulator

Commercial tools for Arm

Momentum Timeline of commercial HPC tools from Arm

Continued commitment to high performance computing

SC15

- Launch of **Performance Libraries -** Optimized BLAS, LAPACK and FFT

SC16

- Launch of **C/C++ Compiler -** Linux user space compiler

2016 Dec

- Acquisition of **Allinea,** the leading HPC tools provider

ISC17

- Beta availability of **Fortran Compiler**

SC17

- Launch of **Arm Allinea Studio**
- A comprehensive and integrated tools suite for Scientific Computing, HPC and Enterprise

arm ALLINEA STUDIO | New commercial bundle

Meets the requirements of HPC developers on Arm

Cross-platform debug and profile tools

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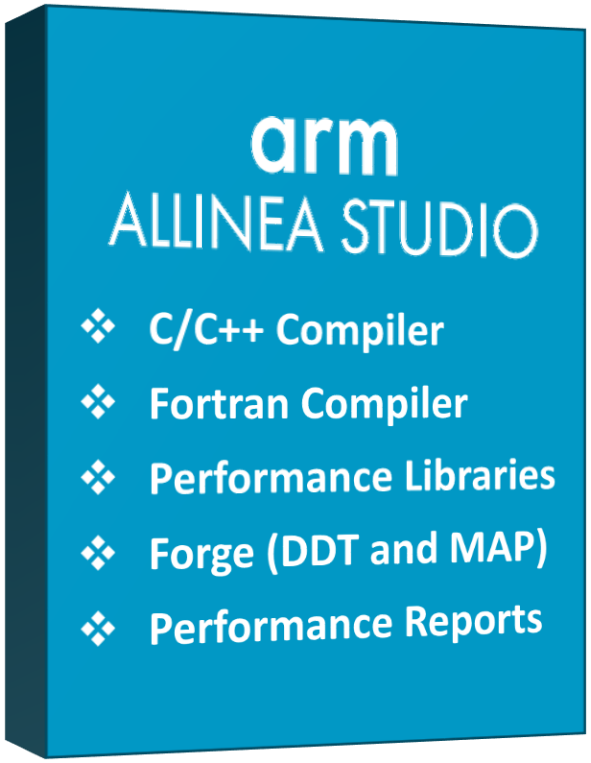
Arm-only Compiler and Libraries

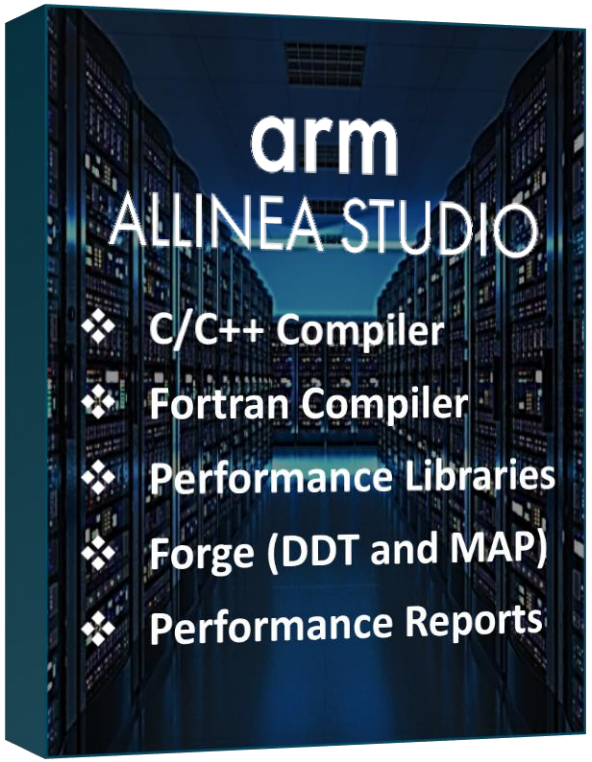
Forge and Performance Reports supports server-class Arm-based platforms like Cavium ThunderX2



Arm Compilers now work well with Forge and Performance Reports

Arm Allinea Studio

A new commercial bundle from Arm for HPC developers



Comprehensive and integrated tool suite for Scientific computing, HPC and Enterprise developers

Seamless end-to-end workflow from getting started to advanced optimization of your workloads

Ready for current and future generations of server-class Arm-based platforms

Commercially supported by Arm engineers

Frequent releases with continuous performance improvements

Arm Allinea Studio

A quick glance at what is in Arm Allinea Studio

C/C++ Compiler

- C++ 14 support
- OpenMP 4.5 without offloading
- SVE ready

Fortran Compiler

- Fortran 2003 support
- Partial Fortran 2008 support
- OpenMP 3.1
- SVE ready

Performance Libraries

- Optimized math libraries
- BLAS, LAPACK and FFT
- Threaded parallelism with OpenMP

Forge (DDT and MAP)

- Profile, Tune and Debug
- Scalable debugging with DDT
- Parallel Profiling with MAP

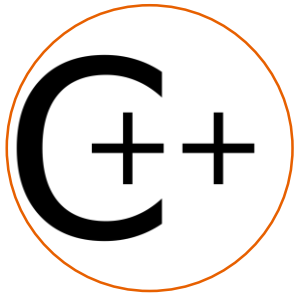
Performance Reports

- Analyze your application
- Memory, MPI, Threads, I/O, CPU metrics

Tuned by Arm for a wide-range of server-class Arm-based platforms

What's new since SC16?

A new tools suite that works well together, with a commercial Fortran compiler

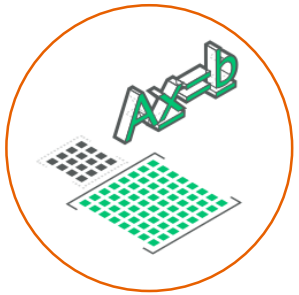


C/C++ Compiler

- Optimizations and bug fixes
- Upgrade to LLVM 5
- Compiler Optimization report

Fortran Compiler

- Fully supported commercial Fortran compiler on Arm



Perf Libraries

- GEMM tuning for ThunderX2 and Qualcomm Falkor
- FFT optimizations
- Batched BLAS

Forge

- Arm hardware performance counters support
- Interop with Arm Compiler and Libraries

Perf Reports

- Armv8 support
- Arm hardware performance counters support
- Interop with Arm Compiler and Libraries

Tuning for Cavium ThunderX2 and Qualcomm Centriq based platforms

arm PERFORMANCE LIBRARIES

Optimized BLAS, LAPACK and FFT

Commercially supported by Arm

Best serial and parallel performance

Validated with NAG test suite

Commercial 64-bit Armv8-A math libraries

- Commonly used low-level math routines - BLAS, LAPACK and FFT
- FFTW compatible interface for FFT routines
- Batched BLAS support

Best serial and parallel performance

- Generic Armv8-A optimizations by Arm
- Tuning for specific platforms like Cavium ThunderX2 in collaboration with silicon vendors

Validated and supported by Arm Engineers

- Available for a wide range of server-class Arm-based platforms
- Validated with NAG's test suite, a de-facto standard

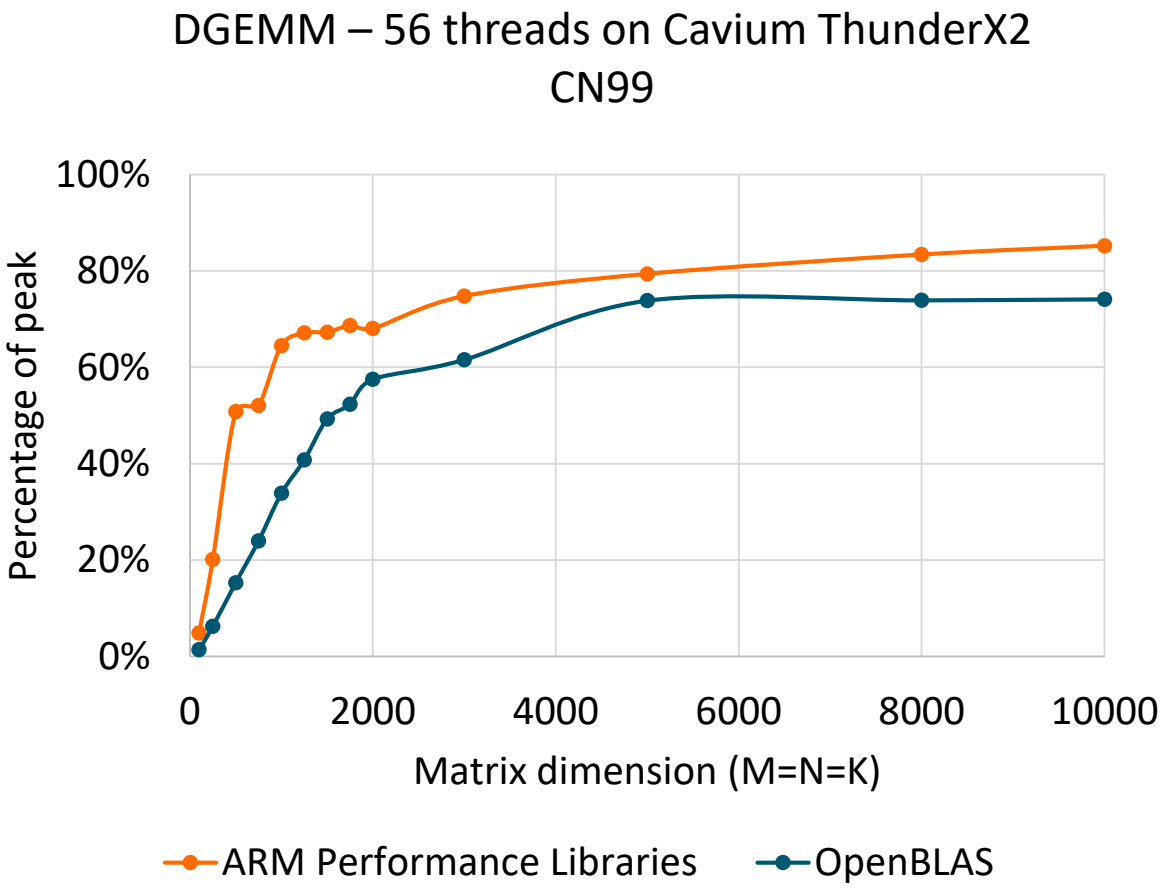
DGEMM performance on Cavium ThunderX2

Excellent serial and parallel performance

Achieving very high performance at the node level leveraging high core counts and large memory bandwidth

Single core performance at 95% of peak

Parallel performance significantly higher than OpenBLAS



arm COMPILER

Commercial C/C++/Fortran compiler with best-in-class performance

Compilers tuned for Scientific Computing and HPC

Latest features and performance optimizations

Commercially supported by Arm

Tuned for Scientific Computing, HPC and Enterprise workloads

- Processor-specific optimizations for various server-class Arm-based platforms
- Optimal shared-memory parallelism using latest Arm-optimized OpenMP runtime

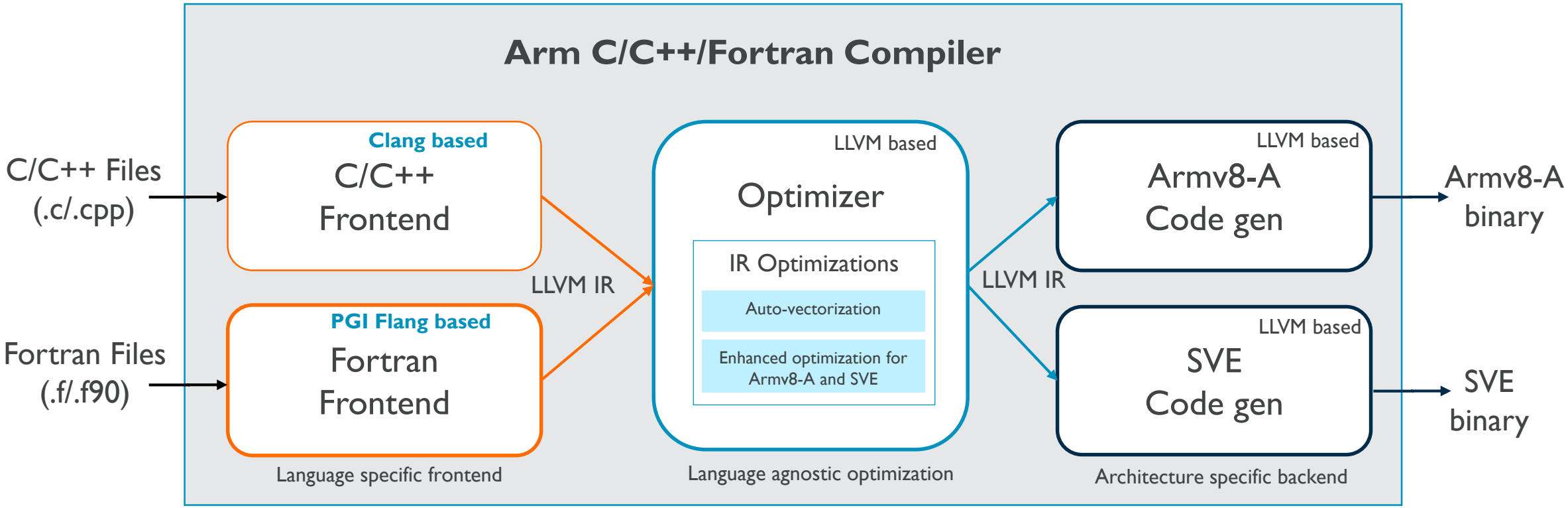
Linux user-space compiler with latest features

- C++ 14 and Fortran 2003 language support with OpenMP 4.5*
- Support for Armv8-A and SVE architecture extension
- Based on LLVM and Flang, leading open-source compiler projects

Commercially supported by Arm

- Available for a wide range of Arm-based platforms running leading Linux distributions – RedHat, SUSE and Ubuntu

Arm Compiler – Building on LLVM, Clang and Flang projects

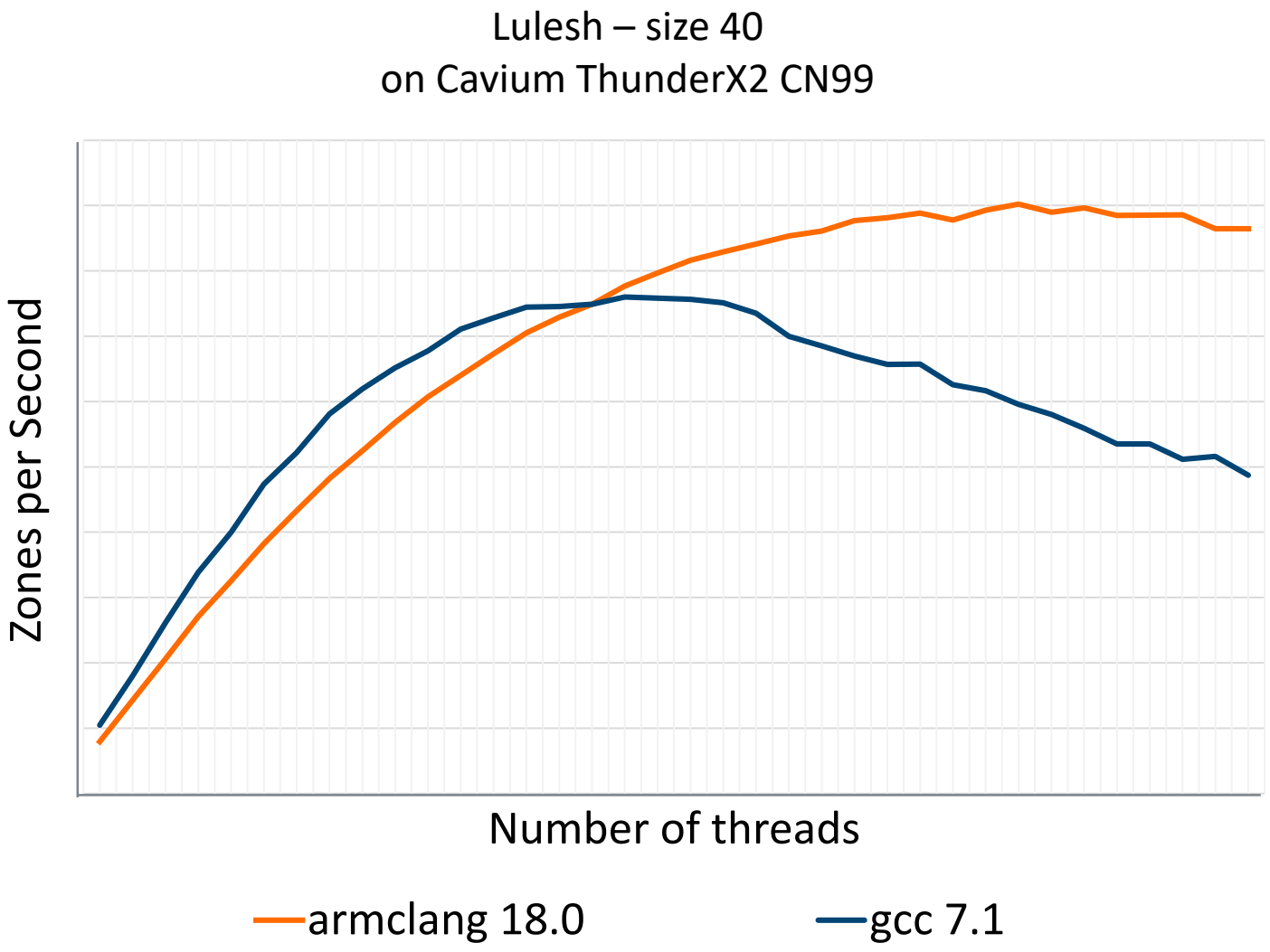


Arm Compiler – OpenMP scaling

Better scaling at higher thread count

Arm Compiler uses libomp based optimized OpenMP runtime.

For Lulesh, Arm Compiler shows better scaling than GCC for higher thread count



Future roadmap

Compiler and Libraries

Fortran Compiler

- Improvements in debugging
- Increased Fortran 2008 support
- Improved OpenMP 4.5 support

All compilers

- Improvements in optimization report

More features in compilers

- Application specific tuning and optimization
- For Cavium ThunderX2 and other server-class Arm-based platforms

More optimizations for current hardware

- SVE enabled Performance Libraries
- Application specific tuning and optimization in Compilers and Libraries for SVE

Getting ready for SVE-based future hardware

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